

	<b>Title</b>	<b>Current OR</b>
<b>1</b>	<b>Ultrasonic transducer array having laser-drilled vias for electrical connection of electrodes</b>	<b>367/155</b>
<b>2</b>	<b>Method of manufacturing a microactuator</b>	<b>29/25.35</b>
<b>3</b>	<b>Broadband phased array transducer design with frequency controlled two dimension capability and methods for manufacture thereof</b>	<b>600/459</b>
<b>4</b>	<b>Broadband phased array transducer design with frequency controlled two dimension capability and methods for manufacture thereof</b>	<b>600/459</b>
<b>5</b>	<b>Method of manufacturing piezoelectric-resonator having vibrating spaces formed therein</b>	<b>29/25.35</b>
<b>6</b>	<b>Method of manufacturing a piezoelectric vibrator capable of reliably preventing dielectric breakdown</b>	<b>29/25.35</b>
<b>7</b>	<b>Method of manufacturing a piezoelectric tuning fork resonator</b>	<b>29/25.35</b>
<b>8</b>	<b>Apparatus for passive damping of a structure</b>	<b>310/326</b>
<b>9</b>	<b>Method for encapsulating a ceramic device for embedding in composite structures</b>	<b>29/25.35</b>
<b>10</b>	<b>Piezo-electric transducer having electrodes that adhere well both to ceramic as well as to plastics</b>	<b>367/164</b>
<b>11</b>	<b>Two-dimensional piezoelectric transducer assembly</b>	<b>310/337</b>

	<b>Title</b>	<b>Current R</b>
<b>12</b>	<b>Laminat d piezo lectric keyb ard</b>	<b>341/34</b>
<b>13</b>	<b>Embedded piezoelectric structure and control</b>	<b>310/328</b>
<b>14</b>	<b>Dual mode transducer</b>	<b>310/322</b>
<b>15</b>	<b>Anti-icing and deicing device</b>	<b>244/134D</b>
<b>16</b>	<b>Impulse ink jet print head and method of making same</b>	<b>347/40</b>
<b>17</b>	<b>Polymeric piezoelectric ultrasonic probe</b>	<b>367/140</b>
<b>18</b>	<b>Lead structure for a piezoelectric array-type ultrasonic probe</b>	<b>310/334</b>
<b>19</b>	<b>Piezoelectric stress wave transducer with boron nitride piezo support</b>	<b>310/338</b>
<b>20</b>	<b>Device sensitive to pressure waves</b>	<b>73/658</b>
<b>21</b>	<b>Drag modificati n piez l ctric panels</b>	<b>310/316.01</b>

	<b>Current XRef</b>
<b>1</b>	<b>310/334; 310/336; 310/365; 310/366; 367/140</b>
<b>2</b>	<b>310/369; 427/100</b>
<b>3</b>	<b>310/334</b>
<b>4</b>	<b>310/367; 310/369</b>
<b>5</b>	<b>310/340</b>
<b>6</b>	<b>264/435; 310/357; 310/366</b>
<b>7</b>	<b>310/321; 310/370</b>
<b>8</b>	<b>310/345</b>
<b>9</b>	<b>310/340</b>
<b>10</b>	<b>310/366</b>
<b>11</b>	<b>310/334; 310/359; 310/366; 367/155; 367/180</b>

	<b>Current XRef</b>
<b>12</b>	<b>200/5A; 200/512; 310/339; 310/340</b>
<b>13</b>	<b>29/25.35; 310/316.01; 310/317; 310/323.21; 310/326; 310/330; 310/331; 310/339; 310/340</b>
<b>14</b>	<b>310/317; 310/324; 310/339</b>
<b>15</b>	<b>244/134F; 244/134R</b>
<b>16</b>	<b>347/70</b>
<b>17</b>	<b>310/311; 310/325; 310/334; 310/359; 310/366; 310/800</b>
<b>18</b>	<b>174/52.4; 310/335; 310/365; 361/772</b>
<b>19</b>	<b>310/327; 310/346</b>
<b>20</b>	<b>310/800</b>
<b>21</b>	<b>310/311; 310/338; 310/800; 73/861.72; 73/DIG.4</b>

	<b>Current XRef</b>
<b>22</b>	<b>310/322; 310/334; 381/190</b>
<b>23</b>	<b>310/326; 310/330; 310/366; 984/371; 984/DIG.1</b>
<b>24</b>	<b>310/346; 338/5; 73/DIG.4</b>

	<b>Title</b>	<b>Current OR</b>
<b>22</b>	<b>Piezo I ctric transduc r arrang ment with integral terminals and h using</b>	<b>310/324</b>
<b>23</b>	<b>Vibration detecting device having a piezoelectric ceramic plate and a method for adapting the same for use in musical instruments</b>	<b>310/323.21</b>
<b>24</b>	<b>FORCE TRANSDUCER UNITS WITH MULTIPLE SENSING ELEMENTS</b>	<b>310/328</b>

US-PAT-NO: 5687462

DOCUMENT-IDENTIFIER: US 5687462 A

TITLE: Packaged strain actuator

DATE-ISSUED: November 18, 1997

INVENTOR-INFORMATION:

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STATE ZIP CODE COUNTRY		
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US-CL-CURRENT: 29/25.35, 29/830 , 29/841 , 310/330 ,  
310/331 , 310/366

ABSTRACT:

A modular actuator assembly includes one or more plates or elements of electro-active material bonded to an electroded sheet, preferably by a structural polymer to form a card. The card is sealed, and may itself constitute a practical device, such as a vane, shaker, stirrer, lever, pusher or sonicator for direct contact with a solid or immersion in a fluid, or may be bonded by a stiff adhesive to make a surface-to-surface mechanical coupling with a solid workpiece, device, substrate machine or sample.

The structural polymer provides a bending stiffness such that the thin plate does not deform to its breaking point, and a mechanical stiffness such that shear forces are efficiently coupled from the plate to the workpiece. In further embodiments,

the card may include active circuit elements for switching, powering or processing signals, and/or passive circuit elements for filtering, matching or damping signals, so that few or no connections to outside circuitry are

required. The actuator assembly can be manufactured in quantity, to provide a versatile actuator with uniform mechanical and actuation characteristics, that introduces negligible mass loading to the workpiece. The cards themselves may be arranged as independent mechanical actuators, rather than strain-transfer actuators, in which the induced strain changes the position of the card.

Various arrangements of pinned or cantilevered cards may act as a pusher, bender or other motive actuator, and structures such as powered bellows may be formed directly by folding one or more suitably patterned cards.

8 Claims, 32 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 9



<b>L Number</b>	<b>Hits</b>	<b>Search Text</b>	<b>DB</b>	<b>Time stamp</b>
<b>1</b>	<b>19</b>	<b>Spangler near Ronald.inv.</b>	<b>USPAT; US-P PUB; EPO; JPO; DERWENT; IBM_TDB</b>	<b>2003/09/25 09:16</b>
-	<b>0</b>	<b>"vibration control system".ti. and 29/\$.ccls.</b>	<b>USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB</b>	<b>2003/09/25 09:15</b>
-	<b>0</b>	<b>"vibration control system". and 29/\$.ccls.</b>	<b>USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB</b>	<b>2003/09/25 09:12</b>
-	<b>564</b>	<b>"vibration control system"</b>	<b>USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB</b>	<b>2003/09/24 13:13</b>
-	<b>2</b>	<b>6404107.pn.</b>	<b>USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB</b>	<b>2003/09/24 13:11</b>
-	<b>2</b>	<b>6069433.pn.</b>	<b>USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB</b>	<b>2003/09/24 13:11</b>
-	<b>0</b>	<b>"vibration control system" and substrate and sensor and circuit adj element</b>	<b>USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB</b>	<b>2003/09/24 13:14</b>
-	<b>10</b>	<b>"vibration control system" and sensor and circuit adj element</b>	<b>USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB</b>	<b>2003/09/24 13:16</b>
-	<b>165</b>	<b>"vibration control system" and sensor and circuit</b>	<b>USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB</b>	<b>2003/09/24 13:16</b>
-	<b>1</b>	<b>2000-506017.NRAN.</b>	<b>DERWENT</b>	<b>2003/09/24 13:26</b>

-	2	actuator adj assembly and PZT and conductor and active adj element and 29/\$.ccls.	USPAT; US-P PUB; EPO; JPO; DERWENT; IBM_TDB USPAT	2003/09/25 08:14
-	24	("3582691"   "4054808"   "4240002"   "4363991"   "4461179"   "4578611"   "4611141"   "4651310"   "4680595"   "4732351"   "4761582"   "4849668"   "4857887"   "4864179"   "4914565"   "5305507"   "5315203"   "5341550"   "5400488"   "5410789"   "5415175"   "5438998"   "5454146"   "5493541").PN.	USPAT	2003/09/24 15:34
-	5	("3071841"   "3175107"   "4376302"   "4692652"   "4780639").PN.	USPAT	2003/09/24 15:36
-	24	("3582691"   "4054808"   "4240002"   "4363991"   "4461179"   "4578611"   "4611141"   "4651310"   "4680595"   "4732351"   "4761582"   "4849668"   "4857887"   "4864179"   "4914565"   "5305507"   "5315203"   "5341550"   "5400488"   "5410789"   "5415175"   "5438998"   "5454146"   "5493541").PN.	USPAT	2003/09/24 15:45
-	9	"vibration control system" and lens adj assembly	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB USPAT	2003/09/25 08:08
-	0	20030040818.URPN.	USPAT	2003/09/25 08:10
-	5	("3071841"   "3175107"   "4376302"   "4692652"   "4780639").PN.	USPAT	2003/09/25 08:13
-	24	("3582691"   "4054808"   "4240002"   "4363991"   "4461179"   "4578611"   "4611141"   "4651310"   "4680595"   "4732351"   "4761582"   "4849668"   "4857887"   "4864179"   "4914565"   "5305507"   "5315203"   "5341550"   "5400488"   "5410789"   "5415175"   "5438998"   "5454146"   "5493541").PN.	USPAT	2003/09/25 08:15
-	2	4857887.pn.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB USPAT; US-PGPUB; EP ; JP ; DERWENT; IBM_TDB	2003/09/25 08:38
-	2	4651310.pn.	USPAT; US-PGPUB; EP ; JP ; DERWENT; IBM_TDB	2003/09/25 08:39

-	2	5315203.pn.	USPAT; US-P PUB; EP ; JPO; DERWENT; IBM_TDB	2003/09/25 08:39
-	0	"vibration c ntrol system" and Sprangler .inv.and 29/\$.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/25 09:12
-	0	"vibration control system" and Sprangler .inv.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/25 09:12
-	3	Sprangler .inv.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/25 09:14
-	0	Ronald near Sprangler .inv.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/09/25 09:14